SUBCOURSE
MM5039

EDITION
8

U.S. ARMY AVIATION CENTER

TROUBLESHOOT AND REPAIR COMMUNICATIONS SYSTEM CONTROL C-6533/ARC

THIS COURSE HAS BEEN REVIEWED FOR OPERATIONS SECURITY

THE ARMY INSTITUTE FOR PROFESSIONAL DEVELOPMENT
ARMY CORRESPONDENCE COURSE PROGRAM

AIPD

READINESS/ PROFESSIONALISM
THRU GROWTH

(Development Date: October 1987)

US ARMY AVIONICS COMMUNICATIONS EQUIPMENT REPAIR COURSE
MOS 35L SKILL LEVELS 1 AND 2

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Electronic's Department

TROUBLESHOOT AND REPAIR COMMUNICATIONS SYSTEM CONTROL C-6533/ARC

SUBCOURSE NUMBER: MM5039
(Development Date: October 1987)

US ARMY AVIATION CENTER
FORT RUCKER, ALABAMA 36362-5000

6 CREDIT HOURS

GENERAL

Maintenance of the communications system control C-6533/ARC is the responsibility of the Avionic Communications Equipment Repairer MOS 35L Skill Level 1. This subcourse is designed to teach the knowledge necessary to troubleshoot and repair the communications system control C-6533. This subcourse is presented in three lessons corresponding to the learning objectives listed below.

Lesson 1
IDENTIFY AND DESCRIBE THE FUNCTIONS OF THE MAJOR COMPONENTS AND THEORY OF OPERATION OF COMMUNICATIONS SYSTEM CONTROL C-6533

Whenever pronouns or other references denoting gender appear in this document, they are written to refer to either male or female unless otherwise indicated.

TASK

Identify and describe the functions of the major components, and describe the theory of operation of communications system control C-6533.

CONDITIONS

PERFORMANCE AND PERFORMANCE-ORIENTED: Given information on the major components and their function, and diagrams describing the theory of operation of the communications system control C-6533.

STANDARD

PERFORMANCE: Minimum acceptable performance is evident when the soldier can identify and describe the functions of the major components and describe the theory of operation in one of two attempts without error.

PERFORMANCE-ORIENTED: Demonstrate competency of the task skills and knowledge by correctly responding to 80 percent of the multiple-choice test covering the identification and description of the functions of the major components and the theory of operation of communications system control C-6533.

Lesson 2
TROUBLESHOOT COMMUNICATIONS SYSTEM CONTROL C-6533

TASK

Troubleshoot communications system control C-6533.

CONDITIONS

PERFORMANCE: Given a C-6533, extracts of TM 11-5821-262-35, MK-994/AR, signal generator AN/URM-127, multimeter AN/PSM-45, headset microphone H-101A/U (two each), voltmeter ME-30A/U, multimeter ME-26B/U.

PERFORMANCE-ORIENTED: Given information contained in this lesson, pencil, paper, and without supervision.

STANDARD

PERFORMANCE: Minimum acceptable performance is evident when the student can isolate one of two malfunctions within 30 minutes per problem IAW TM 11-5821-262-35 extracts and troubleshooting chart, paragraph 3-8, TM 11-5821-262-35.

PERFORMANCE-ORIENTED: Demonstrate competency of task skills and knowledge by correctly responding to 80 percent of the multiple-choice test on troubleshooting communications system control C-6533.

Lesson 3
REPAIR COMMUNICATIONS SYSTEM CONTROL C-6533

TASK

Repair communications system control C-6533.

CONDITIONS

PERFORMANCE: Given a C-6533, extracts of TM 11-5821-262-35, MK-994/AR, multimeter ME-26B/U, multimeter AN/PSM-45, signal generator AN/URM-127, voltmeter ME-30A/U, headset microphone H-101A/U (two each), tool kit TK-105G, and a qualified OJT monitor.

PERFORMANCE-ORIENTED: Given information contained in this lesson, pencil, paper, and without supervision.

STANDARD

PERFORMANCE: Minimum acceptable performance is evident when the student can repair communications system control C-6533 by replacing a faulty replaceable part/component assembly in one of two attempts within 30 minutes IAW Chapters 3 and 4 of TM 11-1521-262-35.

PERFORMANCE-ORIENTED: Demonstrate competency of task skills and knowledge by correctly responding to 80 percent of the multiple-choice test covering repair of communications system control C-6533.

(These objectives support SM Tasks 113-586-0144 and 113-586-4132.)

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*** * * IMPORTANT NOTICE* * ***

THE PASSING SCORE FOR ALL ACCP MATERIAL IS NOW 70%.

PLEASE DISREGARD ALL REFERENCES TO THE 75% REQUIREMENT.

GRADING AND CERTIFICATION INSTRUCTIONS

INSTRUCTIONS TO THE STUDENT

1. This subcourse contains two versions of the final examination. Version 1 is a performance final examination, which requires the equipment and the assignment of a supervisor OJT monitor to determine your successful completion of the subcourse. Version 2 is a performance-oriented final examination, which does not require the use of equipment and does not require the assignment of a supervisor OJT monitor. Version 2 final examination is a multiple-choice test. To successfully complete Test Version 1 of the subcourse, you must perform the task without error and in one of two attempts within a specified time limit. To successfully complete Test Version 2, you must score a minimum of 80 percent on the test.

2. You are required to take the performance (TEST VERSION 1) final examination. To take the performance final examination, your commander must provide you with all required test equipment and with a supervisor OJT monitor to certify your successful completion of the subcourse.

IMPORTANT NOTE: (READ WITH CARE)

IF YOUR COMMANDER CANNOT PROVIDE THE REQUIRED TEST EQUIPMENT AND A SUPERVISOR OJT MONITOR TO CERTIFY YOUR SUCCESSFUL COMPLETION OF THE SUBCOURSE, YOUR COMMANDER MUST WAIVE THE REQUIREMENTS FOR TRAINING AND TESTING IN THE PERFORMANCE (HANDS-ON WITH THE EQUIPMENT) MODE. TO WAIVE THE PERFORMANCE TRAINING AND TESTING, YOUR COMMANDER MUST CERTIFY THE FOLLOWING ON YOUR ACCP EXAMINATION RESPONSE SHEET (TEST VERSION 2).

COMMANDER'S CERTIFICATION STATEMENT:

I certify the soldier could not be trained and tested in the performance mode. The soldier is waived to be trained and tested in the performance-oriented mode.

X _____
COMMANDER'S NAME/RANK (SSN) (TYPED)

X _____
COMMANDER'S SIGNATURE (DATE)

NOTE: YOU ARE DIRECTED TO ALLOW YOUR COMMANDER TO READ THE ABOVE GRADING AND CERTIFICATION INSTRUCTIONS FOR THIS SUBCOURSE. FAILURE TO FOLLOW THE ABOVE DIRECTIONS WILL RESULT IN YOUR FAILURE OF THE ENTIRE SUBCOURSE.

3. If your commander waives the requirements for you to be trained and tested in the performance mode, the commander must place the above Commander's Certification Statement on your ACCP Examination Response Sheet (Test Version 2) prior to your beginning this subcourse in the performance-oriented training and testing mode. After completing the performance-oriented training, you are required to place your ACCP Examination Response Sheet (Test Version 2) in the self-addressed envelope provided, and mail it to the Institute for Professional Development (IPD), Fort Eustis, Virginia 23455. Six credit hours will be awarded for the successful completion of this subcourse.

INSTRUCTIONS TO OJT MONITOR (PERFORMANCE ONLY)

1. The part you will play in the completion of this subcourse is a very important one.

a. You are to provide all required assistance and guidance during the practice phase of training.

b. You are to discuss the SOJT objective with the student to ensure he understands the practice phase of training.

c. You are to ensure the student has all the equipment, tools, and references to complete this subcourse.

d. During the practice phase of this subcourse, the student will have time to practice on equipment which contains malfunctions. It is recommended that equipment contain natural rather than induced troubles; however, if no equipment with natural malfunctions is available, it will be necessary to induce troubles into the equipment.

e. When you and the student feel sufficient practice has been performed, administer the performance test.

f. If the student feels he can perform the performance test without studying the subcourse, permit him to do so.

2. Testing the student.

a. You are not to provide any assistance or guidance during the graded test.

b. The student must use extracts of TM 11-5821-262-35 which are enclosed with this subcourse.

c. The student will perform the test tasks in sequence. If the first section tests good, the student will continue with the test until a malfunction is discovered. The student will proceed to the appropriate troubleshooting chart and isolate the malfunction.

d. Carefully observe the student during the performance test. A NO-GO in any area constitutes a NO-GO for the test.

e. After administering the performance test, ensure the student has met the time requirements of the task objectives.

f. If a student receives a NO-GO on the first attempt, direct the student to study and practice area(s) failed. Wait at least 24 hours before retesting the student. If the student receives a NO-GO on the retest, indicate NO-GO on the examination response sheet and forward the response sheet to the student's unit commander.

g. Mark only "block 1a" if the student received a GO.

h. Mark only "block 1b" if the student received a NO-GO.

i. Return the ACCP Examination Response Sheet to the student's commander. The commander will certify the student's result as indicated on the PROCEDURES FOR GRADING AND CERTIFICATION SECTION OF THIS SUBCOURSE.

INTRODUCTION

Control communications system C-6533/ARC provides voice communications between crew positions in an aircraft, under high ambient noise conditions, and when used with like communications controls. It also provides switching facilities to permit the operator to select and control associated radio equipment for voice transmission and reception. During this lesson, you will be trained and tested on the theory of operation, on major components and their function, and on troubleshooting and repair procedures for communications system control C-6533/ARC.

NOTE: The communications system control C-6533/ARC will be referred to as the C-6533 throughout this subcourse.

LESSON 1

IDENTIFY AND DESCRIBE THE FUNCTIONS OF THE MAJOR COMPONENTS, AND THE THEORY OF OPERATION OF COMMUNICATIONS SYSTEM CONTROL C-6533

TASK

Identify and describe the functions of the major components, and describe the theory of operation of communications system control C-6533.

CONDITIONS

PERFORMANCE AND PERFORMANCE-ORIENTED: Given information on the major components and their function, and diagrams describing the theory of operation of the communications system control C-6533.

STANDARD

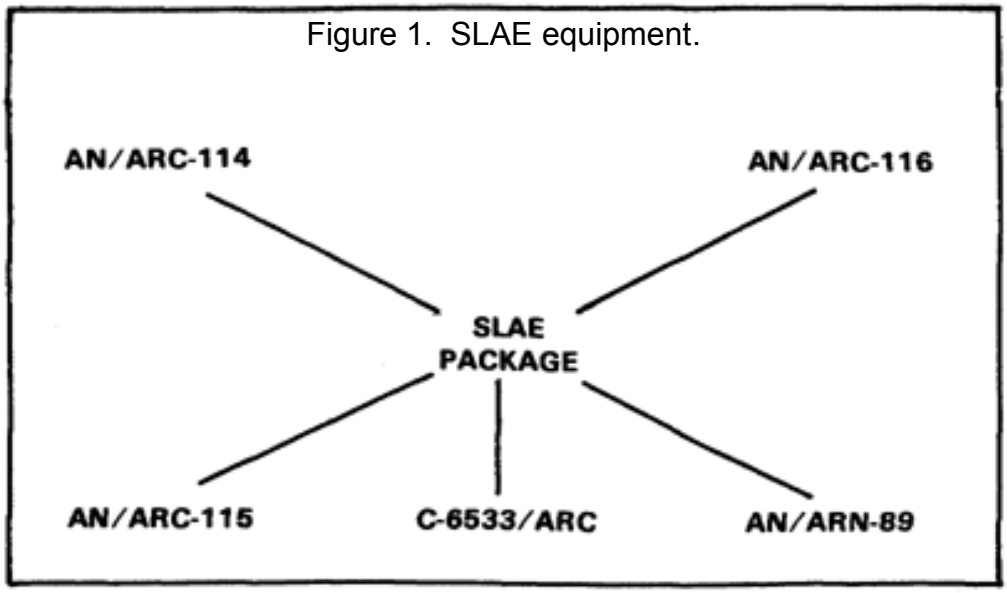
PERFORMANCE: Minimum acceptable performance is evident when the student can identify and describe the functions of the major components and describe the theory of operation in one of two attempts without error.

PERFORMANCE-ORIENTED: Demonstrate competency of the task skills and knowledge by correctly responding to 80 percent of the multiple-choice test covering the identification and description of the functions of the major components and the theory of operation of communications system control C-6533.

Learning Event 1:
INTRODUCTION TO COMMUNICATIONS SYSTEM CONTROL C-6533

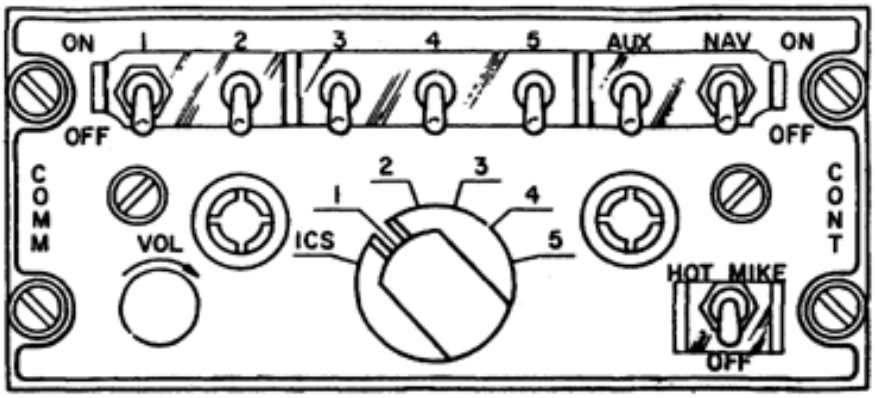
1. Communications system control C-6533. The C-6533 is part of a family of electronics equipment known as the standard lightweight avionics equipment (SLAE) package. (See Figure 1.) This system provides eight functions that can be selected by flight crew members when desired. This aircraft communications system control allows the pilot/copilot and crew members to utilize the aircraft communications system. This lesson will enable you to become proficient using the functional controls and to understand the major components of the C-6533.

Figure 1. SLAE equipment.



2. Description and use of operator controls and indicators. The C-6533 is a panel mounted assembly. All operating controls and panel lamps are mounted on the front panel. The operating controls consist of seven receiver ON-OFF toggle switches, a HOT MIKE toggle switch, a six-position ROTARY SELECTOR switch, and a VOL control. (See Figure 2.)

Figure 2. Operator controls and indicators.



3. Function of major controls.

a. The SELECTOR switch (S1) is located in the center of the front panel. It has six positions.

(1) FM transceiver.

(3) UHF transceiver.

(4) Not used.

(5) Second FM transceiver.

NOTE: You can transmit and monitor without interfering with other crew members in these positions. Positions 1 through 5 are used when selecting radio transceiver operation.

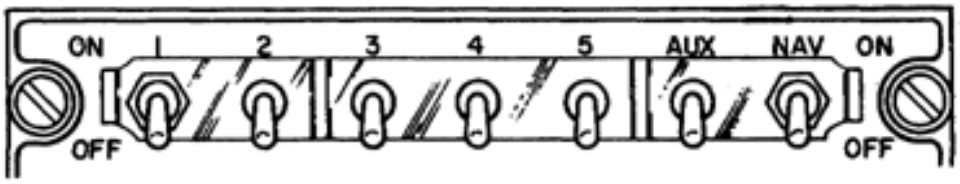
(6) Interphone communications system (ICS). This position is used to communicate within the aircraft without interfering with incoming calls and without having to overcome the noise of the aircraft engines. The ICS position does not select a transceiver, nor does it allow you to transmit outside the aircraft.

b. The C-6533 also has hands free interphone operation using the HOT MIKE switch (S2) located in the lower right-hand corner. Hand-free operation is performed by placing the SELECTOR switch in the ICS position and the HOT MIKE switch is moved up to the ON position.

NOTE: The only time the HOT MIKE is used is when the crew members are busy and need both hands to perform other flight operations. If the SELECTOR switch is moved from ICS to any other position during HOT MIKE operation, you will be constantly transmitting.

c. The seven toggle switches (S3-S9) across the top front of the C-6533 are used to monitor any of eight audio input signals. (See Figure 3.)

Figure 3. RECEIVER SELECTOR switches.



SWITCH	MONITOR	
1	MONITOR	FM TRANSCEIVER
2	MONITOR	VHF TRANSCEIVER
3	MONITOR	UHF TRANSCEIVER
4	MONITOR	NOT USED
5	MONITOR	2D FM TRANSCEIVER
AUX	MONITOR	AUXILIARY (special application)
NAV	MONITOR	NAV 1 and NAV 2 CONTROL

NOTE: Remember, although the SELECTOR switch also monitors transmission, it monitors only one transceiver at a time.

Learning Event 2:
THEORY OF OPERATION OF C-6533

1. BLOCK DIAGRAMS. The C-6533 has three operational modes. These are the ICS mode, the radio transmit mode, and the receiver monitoring mode.

a. ICS mode. (See Figure 4.) All communication controls in an aircraft are connected to an interphone line. When an operator's PUSH-TO-TALK switch is operated in the interphone (ICS) position, microphone amplifier AR1 of the operator's communications control is turned on, and its output is applied to the interphone line through relay K1. Operation of the PUSH-TO-TALK switch also decreases the operator's sidetone signal level. Signals on the interphone line, including the operator's voice signals, pass through the mixing resistor network to VOL control R34 and to headset amplifier AR2. The output of the headset amplifier is applied to the operator's headset through transformer T4.

Figure 4. Interphone function, block diagram.

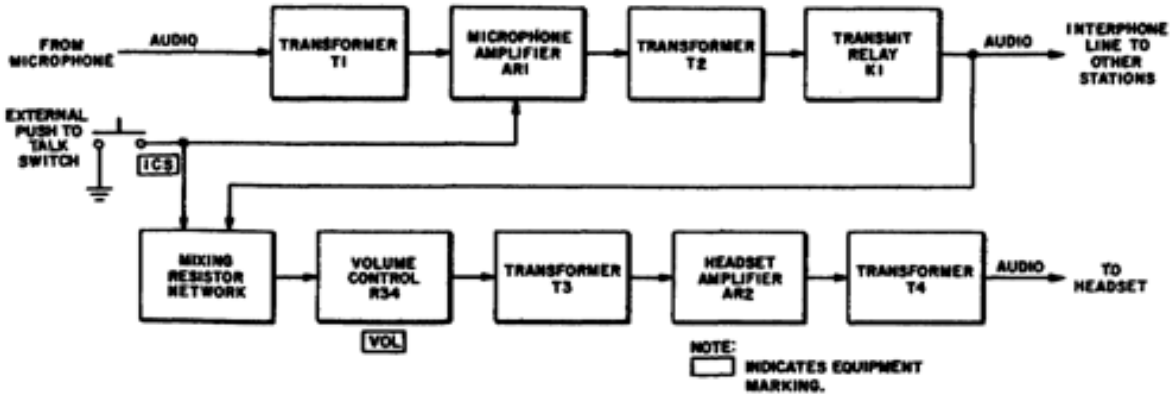
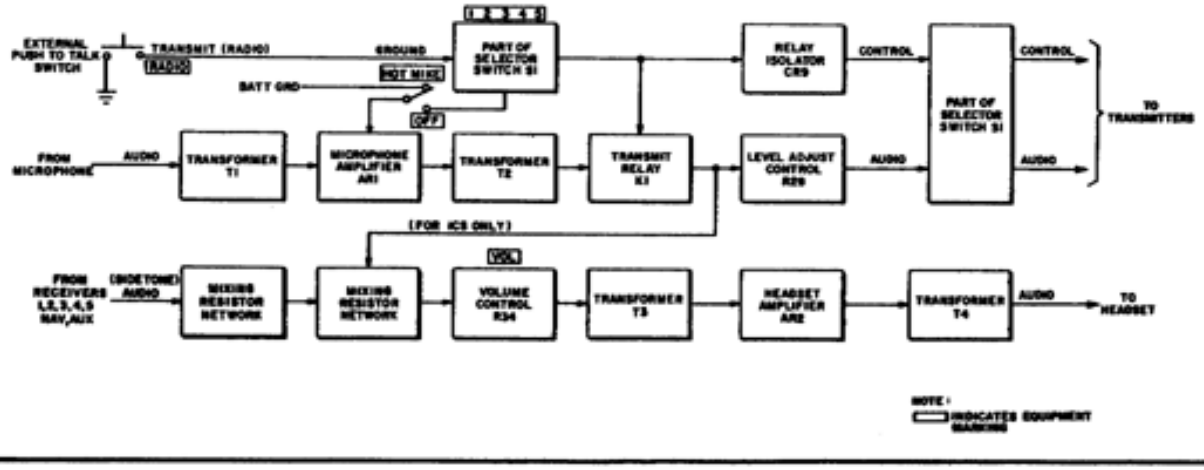
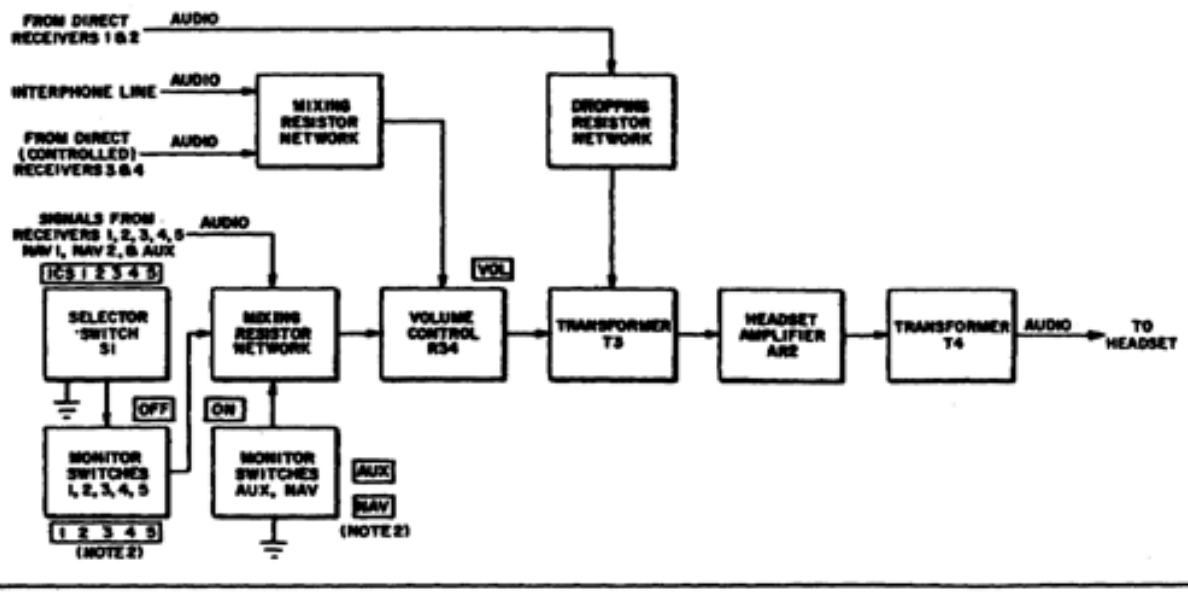


Figure 5. Transmit function, block diagram.



b. Radio transmit mode (see Figure 5): When an operator operates the PUSH-TO-TALK switch to the transmit (RADIO) position and SELECTOR switch S1 is set in position 1, 2, 3, 4, or 5, microphone amplifier AR1 is turned on and transmit relay K1 is energized. The microphone amplifier audio output is applied to the selected transmitter audio output line through transformer T2, transmit relay K1, level adjust control R29, and SELECTOR switch S1. Level adjust control R29 is set to provide an audio level of 0.4-volt for modulation of the transmitters. Operation of the PUSH-TO-TALK switch also applies a control or keying signal (ground) to the selected transmitter through SELECTOR switch S1 and relay isolator CR9. Setting SELECTOR switch S1 to a transmitter position also connects the associated receiver audio line (1, 2, 3, 4, or 5) to the headset amplifier AR2 through a mixing resistor network and volume control R34. The output is then applied through transformer T4 to the operator's headset. Sidetone signals are received on this circuit and indicate an overall operative system.

Figure 6. Receiver audio monitoring, block diagram.



c. Receiver monitoring mode. (See Figure 6.) The signals from a particular receiver are monitored when S1 is set to position 1, 2, 3, 4, or 5. In addition, seven toggle switches on the communications control permit monitoring of any eight receiver

audio input signals, regardless of what position the SELECTOR switch is in. Receiver audio switches are designated 1, 2, 3, 4, 5, and AUX. Each receives audio from an associated receiver. The NAV-1 and NAV-2 receivers are controlled by the NAV switch. The selected signals are passed to the operator's headset through the mixing resistor networks, VOL control R34, transformers T3 and T4, and headset amplifier AR2. The receiver switches allow individual receiver monitoring or simultaneous monitoring of needed receivers at any time. Direct input lines 3 and 4 and the interphone signal follow similar paths except that these signals have no controlling monitor switches and are continuously and automatically monitored. Direct input lines 1 and 2 follow similar paths except that they are applied directly to T3 and are not controlled by the VOLUME control.

2. C-6533 circuit analysis. See subcourse foldout (FO-1).

a. Headset amplifier AR2.

(1) Amplifier Q4 receives audio input signals from transformer T3 and provides an amplified output which drives phase inverter Q5. Audio from direct input lines 1 and 2 is applied to audio transformer T3 directly. All other audio inputs are applied to the arm of VOLUME control R34 whose setting determines the signal level applied to transformer T3. The output of the transformer secondary is applied to the base of amplifier Q4 through coupling capacitor C12. Capacitors C13 and C29 provide low impedance paths to ground for high frequency interference signals. The collector of Q4 is connected to the positive potential through collector load resistor R16. Resistor R14 provides a DC current path for emitter-to-base bias. Capacitor C14 decouples the audio signals from the +20-volt supply. Negative feedback from the push-pull output stage is applied to emitter resistor R15 from coupling capacitor C19 and resistor R20. Negative feedback reduces distortion and maintains uniform performance characteristics. The output signal for the amplifier is developed across load resistor R16 and is applied to phase inverter Q5 through coupling capacitor C15. Capacitor C16 is a bypass capacitor for high frequency interference signals.

(2) Phase inverter Q5 receives the audio output from amplifier Q4 and provides two 180-degree out-of-phase signals for application to push-pull amplifier Q6 and Q7. The output of amplifier Q4 is applied to the base of Q5 through coupling capacitor C15. Resistors R18 and R19 determine base biasing, and capacitor C17 bypasses audio voltage from the power source. Transistor Q5's current flows through the balanced collector/emitter load resistors R21 and R22.

Capacitor C18 couples a degenerative feedback signal from the collector to the base of Q5. The degenerative signal increases the audio bandwidth and decreases distortion. Output signals at the collector and emitter of Q5 are applied to push-pull amplifier Q6 and Q7 through coupling capacitors C20 and C21 respectively.

(3) Push-pull amplifier Q6 and Q7 provides power amplification for application of the audio to the headset. The two output signals from phase inverter Q5, 180 degrees out-of-phase with each other, are respectively applied to the bases of Q6 and Q7 through coupling capacitors C20 and C21. The input biasing network, for compensation of crossover distortion, consists of resistors R23, R24, and R25 and diode CR7. The input signal is developed across CR6 and CR8 for Q6 and Q7 respectively. The anodes of diodes CR6 and CR8 are biased at a slightly positive potential by the input biasing network. Temperature compensation diode CR7 provides the necessary transistor base/emitter bias over a range of temperatures. The temperature compensation is necessary to assure the proper transistor operating point during changes of transistor characteristics due to heat. Capacitor C22 eliminates high frequency transients from the audio output. The audio signal is applied through output transformer T4 to the headset. A portion of the output signal is fed back to amplifier Q4 through C19 and resistor R20. The feedback signal is degenerative and reduces distortion.

b. Microphone amplifier AR1.

(1) Amplifier Q1 amplifies the microphone audio, and the resultant signal is applied to amplifier Q2. The audio is applied to the base of Q1 through transformer (saturable reactor) T1, coil L1 and coupling capacitor C1. Coil L1 and capacitor C25 form a radio frequency filter. Capacitor C26 provides additional attenuation of radio frequency signals. The amplified output signal is developed across collector load resistor R2. Resistors R3 and R6 are voltage dropping resistors and resistor R1 provides a DC path for the biasing circuit. Capacitors C5 and C6 decouple the audio from the +20 V DC supply. Capacitors C2, C3, and C27 bypass high frequency signals. The amplified signal is applied to amplifier Q2 through coupling capacitor C4.

(2) Amplifier Q2 amplifies the audio output of amplifier Q1 and the resultant signal is applied to driver Q3. The signal is applied to the base of Q2 through coupling capacitor C4. The amplified signal is developed across the collector load and is applied directly to driver Q3. Resistor R4 provides a DC path for the base biasing circuit. Emitter resistor R7 provides current stability.

(3) Driver Q3 amplifies the output of amplifier Q2 and provides a drive signal for audio output transformer T2. Emitter resistor R8 provides current stability, and the primary of audio transformer T2 serves as the collector load. Capacitors C7 and C28 bypass high frequency signals. A portion of the audio output from Q3 is applied to the AGC (automatic gain control) network through diode CR5.

(4) The automatic gain control circuit is active at all times and dependent upon the audio input and output signals of the amplifier. Resistors R6, R10, R11, and R13 form a voltage divider circuit across the +20-volt DC supply. During the no signal condition, the voltage drop across resistor R12 is applied to AGC capacitor C10. The voltage present at the junction of resistor R11 and R13 determines the gating level voltage for the AGC circuit. The gating level voltage is stabilized by capacitor C11 and diode CR4 and forward biases gating diode CR5. During the no-signal condition, the collector voltage of Q3 is more positive than the gating voltage, causing CR5 to be reverse biased. The impedance across the secondary of transformer T1 is high during no- or low-signal inputs. During high-signal inputs, the decrease in collector voltage of driver Q3 causes gating diode CR5 to be forward biased and allows AGC capacitor C10 to charge.

(5) The voltage across C10 and R12 is applied, as forward bias, across diodes CR1 and CR2 to decrease the impedance across the secondary of transformer T1. The lowered impedance across the transformer causes the input audio signal to amplifier Q1 to be attenuated. Resistor R9 controls the AGC voltage decay time, and diode CR3 prevents reverse biasing of diode CR5. Resistor R12 stabilizes the AGC release time.

c. Interphone circuits.

(1) Single switch installation. If an installation is wired using a single pole, single throw PUSH-TO-TALK switch, the SELECTOR switch must be in the ICS position for interphone operation. Operating the PUSH-TO-TALK switch applies a ground through CR13 to the emitter of Q3 in microphone amplifier AR1 to activate the microphone amplifier. The external ground is applied to the communications control through contact 8 to contact 2 on Section 1B rear of the SELECTOR switch and the OFF position contacts of HOT MIKE-OFF switch S2. The audio from microphone amplifier AR1 is applied to the interphone line through transformer T2 and contacts 5 to 7 of de-energized transmit relay K1. Operation of the TALK switch grounds the junction of R35 and R31 through diode CR12 and reduces the interphone sidetone level during talk operation.

Resistor R31 is connected to the junction of R32 and R33. This resistor is grounded during interphone talk operation to provide interphone sidetone reduction. The sidetone reduction makes the operator talk loud to ensure loud and clear reception of his message at all stations. Diode CR14 isolates the keying circuit from the protective device and filter VR1. Diodes CR13 and CR14 are protected from damage by spike voltages by the inclusion of protective diodes CR9 and CR15 as part of VR1.

(2) Dual switch installation. An installation may be wired using a single-pole, double throw (ICS-OFF-TRANSMIT) switch, instead of the single-pole, single throw type. Circuit paths are the same as explained above. The microphone amplifier output is applied to the above except that ground is applied from either contact 2 or 8 of S1B (rear). ICS operation is possible for all positions of the SELECTOR switch.

(3) Hot microphone operation. Hot microphone operation provides hands-free intercommunication of the interphone line. When the HOT MIKE-OFF switch S2 is set to HOT MIKE, the emitter of Q3 in microphone amplifier AR1 is continuously grounded through the HOT MIKE switch, and the microphone amplifier is activated. Audio from microphone amplifier AR1 is then applied to the interphone line through transformer T2 and contacts 5 and 7 of transmit relay K1.

d. Radio transmission circuit. In the transmit mode, SELECTOR switch S1 is set to position 1, 2, 3, 4, or 5. Operation of the PUSH-TO-TALK switch applies a ground to the emitter of transistor Q3 in microphone amplifier AR1 through switch S1B rear to activate the microphone amplifier. A ground is also applied through switch S1B to terminal, 6 (coil) of relay K1 energizing relay K1. Energizing relay K1 connects resistor R30 across the transformer T2 to maintain the proper load on amplifier AR1. The path is through relay K1 contacts 2 and 8. Energizing relay K1 also applies the microphone audio output line through relay contacts 7 to 1, level adjust control R29, dropping resistor R28, and selected contacts of SELECTOR switch S1A front. The level adjust control allows for presetting the amplifier output for 0 dBm (.4-volt) into the 150-ohm transmitter audio input lines. Transmitter audio is applied through the associated receiver to the communications control as a sidetone signal. Operation of the TALK switch also applies a ground signal to the selected transmitter control line keying the transmitter. Ground is applied from the PUSH-TO-TALK switch, and through SELECTOR switch S1B rear to the transmitter control line. Diode CR9 is a blocking diode and prevents ground signals from transmitter control lines from operating relay K1.

CAUTION

THE LEVEL ADJUST CONTROL R29 MUST NOT BE ADJUSTED BY UNAUTHORIZED PERSONNEL, OR FLIGHT SAFETY WILL BE AFFECTED.

e. Audio receiving circuits.

(1) Direct inputs 3 and 4. The audio signals present on these circuits are continuously monitored. The signal passes through mixing resistors R41 and R40 and VOL control R34 to headset amplifier AR1 and then to headset H-101A/U via T4.

(2) Direct inputs 1 and 2. The audio signals from these receivers are continuously monitored. Their level is not controlled by VOL control R34. The signal is applied to the headset through resistors R38 and R39, transformer T3, headset amplifier AR2, and transformer T4.

(3) Interphone. The interphone line connects to all communications controls in the aircraft and is monitored at all times without any operator action required. Audio on the interphone line is applied to headset amplifier AR2 through resistors R33 and R32, VOL control R34, and transformer T3.

(4) Receiver monitoring. Audio from the receivers is applied to a resistor mixing network consisting of resistors R42 through R51. With all monitor switches set to the OFF position, junctions of resistors R42-R43, R44-R45, R46-R47, R48-R49, R50-R51, from receiver audio inputs 1, 2, 3, 4, and 5 respectively, are connected to SELECTOR switch S1B front. With the SELECTOR switch set to ICS, all junctions are grounded, effectively preventing audio signals from these receiver audio input lines from being applied through the headset amplifier to the operator's headset. Resistors R42 through R51 are high in relation to the receiver 150-ohm audio input lines source impedance and the 100-ohm input impedance of the volume control network. Grounding these junction points does not affect audio levels or load impedance of the audio input lines or operation of the communications control.

(a) SELECTOR switch action. When transmitter 1 is selected by setting SELECTOR switch S1 to position 1, the ground circuit at the junction of R42 and R43 is broken and permits audio from the associated receiver 1 to be applied, through resistor R42, VOL control R34, and headset amplifier AR2, to the operator's headset. The other transmitters and associated receivers are selected in the same manner.

(b) RECEIVER switch action. Seven toggle switches permit monitoring of eight receiver audio input signals. Switches designated 1, 2, 3, 4, 5, and AUX control monitoring of any one of six receivers. The NAV switch controls monitoring of two receivers.

All receiver signals or any combination of signals may be monitored simultaneously by operating the associated MONITOR switch to the ON position. Operation of MONITOR switches S3 through S7, associated with receivers 1 through 5, respectively, disconnects the junctions of R42-R43, R44-R45, R46-R47, R48-R49, and R50-R51 from SELECTOR switch S1B front, breaking the ground circuit. The audio signals are applied to the operator's headset through resistors R42, R44, R46, R48, R50, VOL control R34, and headset amplifier AR2. Operation of AUX switch S8 removes ground from the junction of R52-R53 permitting amplification of the AUX receiver audio signal. NAV switch S9 controls the input from NAV-1 and NAV-2 receivers. Resistors R55, and R56 connect the NAV-1 and NAV-2 lines, respectively, to monitor switch S9 and mixing resistor R54. Operation of NAV switch S9 removes the ground from the junction of R54-R55-R56 allowing amplification of the NAV receiver inputs. The mixing resistors act to provide the same output at the headset for all levels of input signals applied to the communications control.

f. Protective device and filter assembly VR1. This assembly filters the +27.5-volt DC input, preventing it from introducing noise in the amplifiers of the communications control, and protects the communications control from damage caused by application of reverse polarity transients up to 80 volts. In addition, it maintains performance of the communications control within specified limits for variations of input voltages from +21 to +29 volts and prevents possible short circuits in the communications control from damaging other equipment in the aircraft. Input is applied to the junction of R57 and the collector of transistor Q8 through protective diode CR11. Diode CR11 prevents damage to the communications control if the 27.5-volt input polarity is reversed. Resistor R57, connected to zener diode CR10, supplies reverse current to CR10 and maintains it in its constant voltage range of operation. Zener diode CR10 is connected to the base of regulating transistor Q8 and holds it at constant voltage when the input power varies from 21 to 29 volts. The emitter of Q8 supplies a constant voltage (approximately 20 volts) to the amplifiers in the communications control when the input power voltage varies from 21 to 29 volts. If the supply voltage drops from 27.5 to 21 volts, the voltage at the collector of Q8 will fall, and the voltage at its emitter will also tend to fall. When the emitter voltage decreases, the base to emitter voltage of Q8 decreases causing its collector resistance to decrease. This decrease in collector resistance tends to maintain the voltage at the emitter of Q8 constant. Capacitor C23 acts to filter ripple voltages which may appear on the power line and limit the amplitude of ripple that is applied to the amplifiers in the

communications control. Diode CR9 protects against spike voltages appearing on the external DC bus. Diode CR15 prevents the generation of spikes by inductive action of relay K1.

g. Filter assembly TB2. L2A and L2B is a filter assembly. It attenuates radio frequency signals which may appear on the +27.5-volt and/or panel lamp power input lines, and prevents them from degrading the performance of the equipment.

3. You have just completed Lesson 1, Identify and Describe the Function of the Major Components and Theory of Operation of the C-6533. If you had problems with this lesson, retake the lesson and then do the practice exercises for this lesson before continuing.

LESSON 1
PRACTICE EXERCISE
(Performance: Hands-On With Equipment)

NOTE: Refer to Page viii for Instructions on completing the practical exercise.

SUBTASK	1ST ATTEMPT GO	1ST ATTEMPT NO-GO	1ST ATTEMPT SOJT MONITOR'S INITIALS	2D ATTEMPT GO	2D ATTEMPT NO-GO	2D ATTEMPT SOJT MONITOR'S INITIALS
1. Identify and explain the function of EXTERIOR controls.						
a. MODE SELECTOR switch.						
b. HOT MIKE switch.						
c. VOLUME control.						
d. Toggle switch 1.						
e. Toggle switch 3.						
f. Toggle switch AUX.						
g. Toggle switch NAV.						

LESSON 1
PRACTICE EXERCISE
(Performance-Oriented)

Answer the following questions by circling the correct response.

1. Operation of the PUSH-TO-TALK switch applies a control or keying signal (ground) to which SELECTOR switch?

   a. S5.

   b. S2.

   c. S1.

   d. S3.

2. What circuit card assembly amplifies the mike audio signal?

   a. AR9.

   b. AR1.

   c. AR2.

   d. All through Q9.

3. What is the protective device and filter assembly that protects the aircraft 27.5 V power from damage due a malfunctioning C-6533?

   a. AR1.

   b. C15.

   c. Q5.

   d. VR1.

4. The NAV receive audio is controlled by what CONTROL switch?

   a. S1.

   b. S5.

   c. S8.

   d. S9.

5. TB2 components L2A and L2B are utilized for what purpose?

   a. Voltage regulator.

   b. Current limiter.

   c. Radio frequency filter.

   d. Audio amplifier.

LESSON 2

TROUBLESHOOT COMMUNICATIONS SYSTEM CONTROL C-6533

TASK

Troubleshoot communications system control C-6533.

CONDITIONS

PERFORMANCE: Given a C-6533, extracts of TM 11-5821-262-35, MK-994/AR, signal generator AN/URM-127, multimeter AN/PSM-45, headset microphone H-101A/U (two each), voltmeter ME-30A/U, multimeter ME-26B/U.

PERFORMANCE-ORIENTED: Given information contained in this lesson, pencil, paper, and without supervision.

STANDARD

PERFORMANCE: Minimum acceptable performance is evident when the student can isolate one of two malfunctions within 30 minutes per problem IAW extracts and troubleshooting chart, paragraph 3-8, TM 11-5821-262-35.

PERFORMANCE-ORIENTED: Demonstrate competency of task skills and knowledge by correctly responding to 80 percent of the multiple-choice test on troubleshooting communications system control C-6533.

Learning Event 1:
TROUBLESHOOT COMMUNICATIONS SYSTEM CONTROL C-6533

1. When troubleshooting the interphone communications set C-6533, the first step is to visually inspect the C-6533 for the following:

   a. Cracks.

   b. Dents.

   c. Broken knobs.

   d. Broken or bent connector pins.

   e. Missing screws.

2. After you have visually inspected the C-6533, you will want to perform an operational test to see if the ICS unit is working properly.

a. You will need the following test equipment to perform the operational test.

(1) Signal generator AN/URM-127.

(2) Voltmeter ME-30A/U.

(3) Test facilities kit MK-994/AR.

(4) Headset microphone H-101A/U (two required).

(5) Multimeter AN/PSM-45.

(6) Multimeter ME-26B/U.

(7) Tool kit TK-100/G.

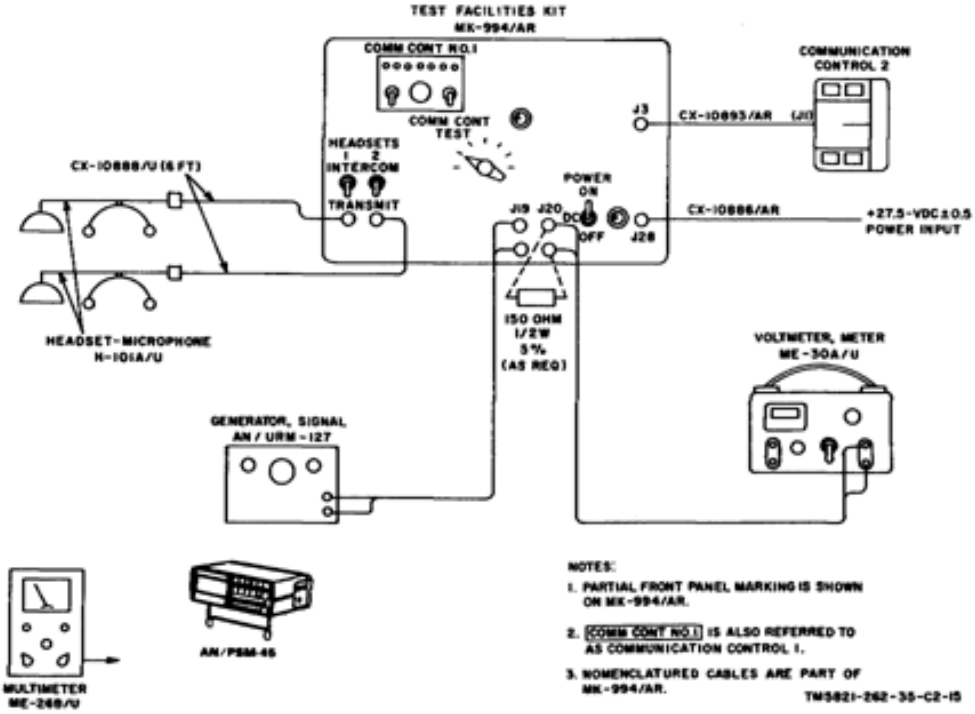
(8) 150-ohm 1/2-watt resistor.

NOTE: Make sure you have an operational C-6533 in the MK-994/AR. Equivalent test equipment may be substituted.

WARNING

IMPROPER CONNECTION OF TEST EQUIPMENT CAN CAUSE DAMAGE TO EQUIPMENT OR BODILY INJURY.

Figure 7. Test setup for troubleshooting and testing.



b. Connect equipment as shown in Figure 7. All cables are part of the MK-994/AR.

(1) Connect cable W9 (CX-10893/AR) between J1 of communications control 2 (being tested) and J3 of the MK-994/AR.

(2) Connect cable W22 (CX-10886/AR) between a +27.5 V DC power source and J28 of the MK-994/AR.

(3) Using cables W20 and W21 (CX-10888/U), connect the two H-101A/U headset microphones to J15 and J16 on the MK-994/AR.

(4) Connect signal generator AN/URM-127 to J19 on the MK-994/AR using a plug-in adapter.

(5) Connect voltmeter ME-30A/U to J20 on the MK-994/AR. Use a plug-in adapter as you did in the previous step.

c. Set controls on test equipment.

(1) Set the front panel controls on the MK-994/AR. (Refer to TM 11-6625-928-12, if needed.)

(2) Set the COMM control 2 (C-6533 being tested) as follows:

(a) Receivers 1 through 5 to OFF.

(b) AUX and NAV receiver to OFF.

(c) VOLUME control fully clockwise.

(d) FUNCTION SELECTOR switch to ICS.

(e) HOT MIKE to OFF.

d. Perform the functional test (three simple steps).

(1) Turn the POWER switch on facilities kit MK-994/AR to the ON position. (The DC power lamp on the test set should light red. If it does not, notify your instructor.)

(2) Test the microphone amplifier.

(a) Hold the MK-994/AR headset 2 switch in the INTERCOM position and speak into the headset 2 microphone.

(b) You will hear the sound of your voice in the headset 1 earphone and at a reduced volume in the headset 2 earphone. Should the test fail and little or no audio is heard in headset 1 earphone, you have a probable fault in the microphone amplifier circuit.

NOTE: Refer to Table 1, code 0|1. (See page 3-4, TM 11-5821-262-35 extract.)

(3) Test the headset amplifier.

(a) Hold the MK-994/AR headset 1 switch in the INTERCOM position. Speak into the headset 1 microphone.

(b) You will hear the sound of your voice in the headset 2 earphone. Should the test fail and no audio is heard in the headset 2 earphone, you have a probable fault in the headset amplifier circuits.

NOTE: Refer to Table 1, code 1|0. (See page 3-4, TM 11-1521-262-35 extract.)

(4) Should both tests fail, the probable fault is in the protective device and filter.

NOTE: Refer to fault isolation guide code Table 1, code 0|0 on page 3-4, TM 11-1521-262-35 extract, Subtest 3.

(5) If all steps show a normal indication, the set is operating properly; however, it is possible that another function is failing.

NOTE: Refer to fault isolation guide Table 1, code 1|1 on page 3-4, TM 11-5821-262-35 extract, Subtest 4.

(6) This ends the functional test of the C-6533. If you do not feel confident in performing this test, repeat the procedure then continue with the lesson.

3. In this section, you troubleshoot the C-6533. (Refer to TM 11-5821-262-35 extract, paragraph 3-8c.) The functional test tells you which subtest to perform. These are listed in Table 1 below.

Table 1. FAULT ISOLATION GUIDE.

MICROPHONE AMPLIFIER	HEADSET AMPLIFIER	PROBABLE FAULTS	SUBTEST NUMBER
0	0	Protective device and filter	1 (Para 3-8c)
0	1	Microphone amplifier	2 (Para 3-8d)
1	0	Headset Amplifier	3 (Para 3-8e)
1	1	All other functions	4 (Para 3-8f)

a. Subtest 1. Fault code 0|0 indicates a protective device and filter problem.

(1) The test equipment setup is the same as for the functional test. Equipment settings are as follows:

(a) COMM CONT NUMBER 1 SELECTOR SWITCH: ICS.

(b) COMM CONT NUMBER 1 VOL CONTROL: Fully clockwise.

(c) COMM CONT TEST: OFF.

(d) DC POWER switch: OFF.

(2) Set the COMM CONT TEST switch to position 1. Using multimeter AN/PSM-45, measure the resistance on the MK-994/AR between J20A and J20B. This tests for a possible shorted interphone line. Normally, you should get a reading between 12.6 and 15.4 ohms. If your reading is not normal, T2 (see TM 11-5821-262-35, page 3-24) should be replaced and the resistance measurement should be repeated.

(3) Normal resistance measurement (12.6 to 15.4) tells you to perform the protective device test. This test requires you to measure the DC voltage between voltage regulator VR1 (TP-7-Emitter) and ground. Using the ME-26, measure the DC voltage to ground. It should be (+) 19-21.0 V DC. If your reading is not normal, you should replace VR1 and repeat this step.

(4) The last step in Subtest 1 will detect a possible broken lead or relay, K1. Equipment settings are as follows:

(a) COMM CONT TEST switch: Position 7.

(b) DC POWER: OFF.

(c) COMM CONT 2 SELECTOR switch: ICS.

(5) Using the AN/PSM-45, measure continuity between J19A and relay K1, terminal 5 in COMM CONT 2. Normal reading is a zero ohms (short) reading. If your reading is abnormal, you need to check for a broken lead.

(6) Check relay K1, repeat the test between J19A and K1, terminal 7. Again, you should read zero ohms (short) for a good indication. If you have an abnormal reading, you would replace relay K1 and repeat the functional test (Lesson 1).

(7) This completes Subtest 1. Repeat this test until you feel confident.

b. Subtest 2. Fault code 0|1 indicates a microphone amplifier AR1 problem.

(1) Test equipment setup is the same as for the functional test. Equipment settings are as follows:

(a) COMM CONT NUMBER 1 SELECTOR switch: ICS.

(b) COMM CONT NUMBER 1 VOL CONTROL: Fully clockwise.

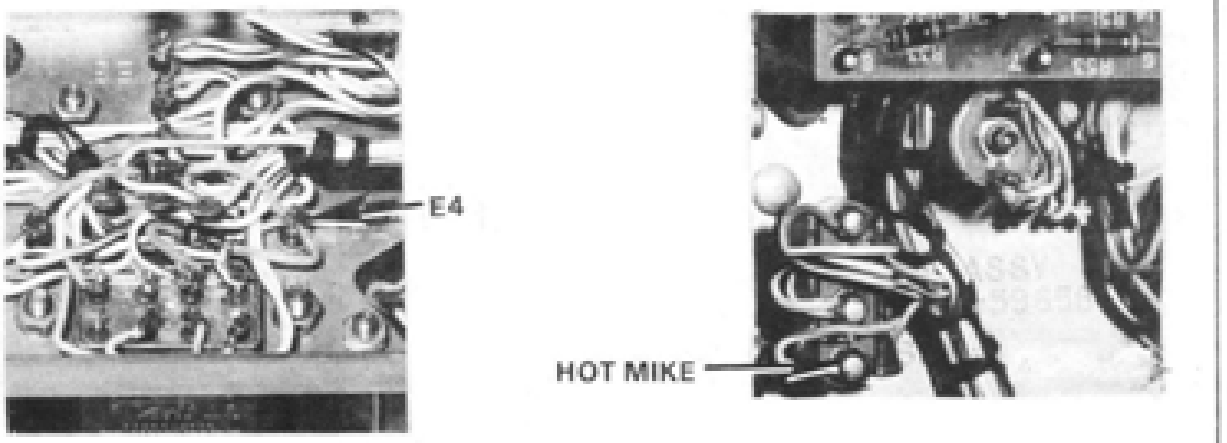
(c) COMM CONT TEST: OFF.

(d) DC POWER switch: OFF.

(2) Using the ME-26 (R X 10 scale), measure the resistance between terminals E5 and E4 on COMM CONT 2 (see page 3-16, TM 11-5821-262-35). Normal reading would be 30 ohms. If you get a higher reading, switch the leads on the terminals. Since we are checking a diode (CR13), you should get a reading that is much higher in the reverse direction than the positive direction (30 ohms, approximately). If your reading was high in both directions, you would replace CR13 and repeat the functional test. Your indication should be approximately 30 ohms in a forward direction.

(3) The HOT MIKE switch test is the next step in Subtest 2. To do this we must set COMM CONT 2 HOT MIKE switch to the OFF position. Using the ME-26, measure the resistance between the HOT MIKE switch S2 and terminal E4. (See Figure 8.) A normal indication would show a short and you would continue with the subtest. If the reading is not normal, replace the HOT MIKE switch and repeat the functional test.

Figure 8. HOT MIKE switch test.



(4) To perform the next step in Subtest 2 make the following equipment settings.

(a) COMM CONT TEST switch: Position 1.

(b) DC POWER: ON.

(c) Disconnect headset H-101A/U from the MK-994/AR at HEADSET 2.

(d) Adjust your URM-127 audio oscillator for 1000 Hz, 0.6 volts RMS output.

(e) COMM CONT 2 HOT MIKE switch to HOT MIKE position.

(5) Perform the following voltage measurements.

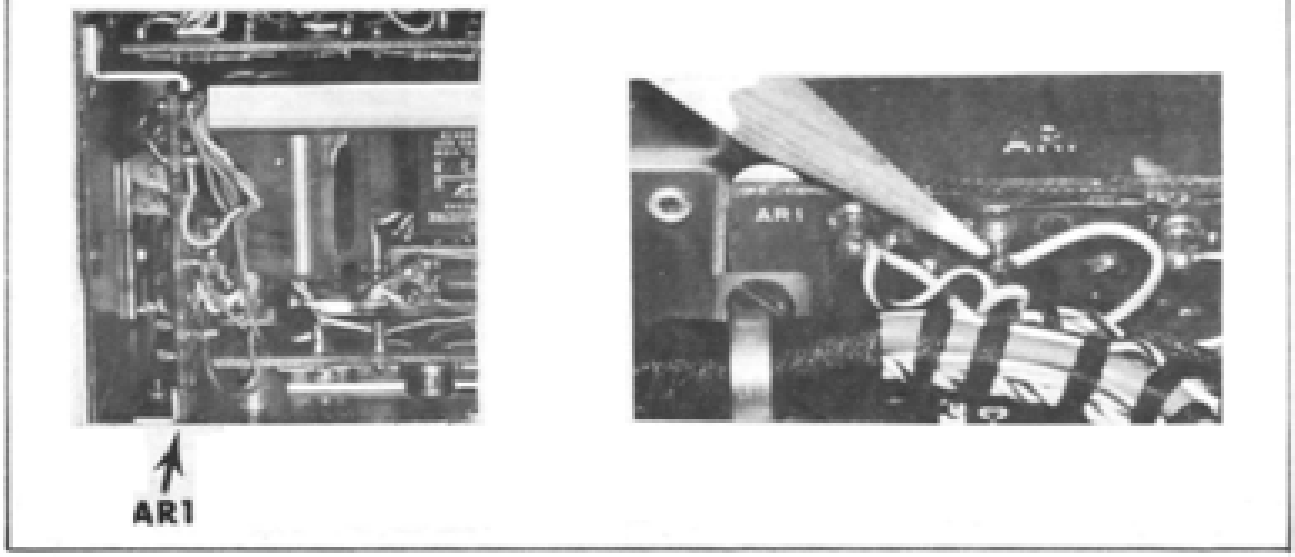
(a) Using your ME-30 (AC voltmeter) measure the amplitude between K1 terminal 7 and ground. The normal reading should be 2.15 - 3.35 volts RMS. Should your reading be abnormal, this would indicate that relay K1 be replaced and then repeat the functional test.

CAUTION

TERMINALS 1 AND 2 of AR1 ARE AT B+ POTENTIAL. USE A MEASURING DEVICE NOT HAVING A COMMON GROUND WITH THE POWER SOURCE. USE A GROUND ISOLATING TRANSFORMER WHEN USING AC POWERED TEST EQUIPMENT TO PREVENT DAMAGE TO THE C-6533 UNDER TEST.

(b) Using the ME-30, measure the amplitude of the signal between AR1 terminal 2 (microphone amplifier board) and ground. (See Figure 9.) A normal reading is 6 to 9 volts RMS. If you have a normal reading you would replace transformer T2 and repeat the functional test.

Figure 9. AR1 terminals.



(c) Using the ME-30, measure the amplitude of the signal between AR1 terminal 3 and ground (see Figure 9). The normal reading will be .001 to .004 volt RMS. If the reading is abnormal, you would replace transformer T1 and make the amplitude measurement again.

(6) Perform the next step of the subtest.

(a) Make the following equipment settings.

1. Remove audio signal.

2. DC POWER: OFF.

3. HOT MIKE: OFF.

(b) Using the ME-26, measure the resistance between AR1-1 and AR1-2 (T2). The normal reading should be 75 to 95 ohms.

1. A normal reading indicates that microphone amplifier assembly (AR1) be replaced.

2. An abnormal reading indicates that T2 (output transformer) needs replacing.

3. After the fault is corrected, perform the functional test.

c. Subtest 3. Fault code 1|0 indicates headset amplifier AR2 problem.

(1) Equipment settings are as follows:

(a) COMM CONT NUMBER 1 SELECTOR switch: ICS.

(b) COMM CONT NUMBER 1 VOLUME CONTROL: Fully clockwise.

(c) COMM CONT NUMBER 1 TEST: Position 7.

(d) DC POWER: ON.

(e) COMM CONT NUMBER 2 SELECTOR switch: ICS.

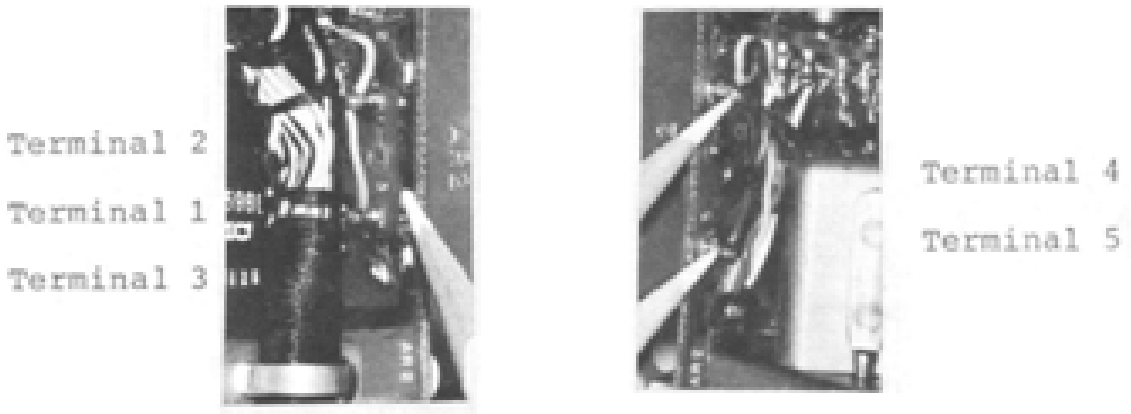
(f) Disconnect headset H-101A/U from MK-994/AR HEADSET 2.

(g) Set AN/URM-127 (audio oscillator) for 1000 Hz, 2.75 volts RMS output.

CAUTION

TERMINALS 1, 2, AND 3 OF AR2 ARE AT B+ POTENTIAL. USE A MEASURING DEVICE NOT HAVING A COMMON GROUND WITH THE POWER SOURCE. USE A GROUND ISOLATING TRANSFORMER WHEN USING AC POWERED TEST EQUIPMENT TO PREVENT DAMAGE TO THE C-6533 UNDER TEST. (See Figure 10.)

Figure 10. Terminals 1 through 5.



(2) Using your ME-30, measure the amplitude of the signal between AR2 terminals 2 and 1, and between terminals 2 and 3. A normal reading is 11.5 to 15.5 volts RMS. If the reading is normal you would replace T4 (output transformer).

(3) Perform equipment settings.

(a) Remove signal input.

(b) Turn DC POWER switch on MK-994/AR to OFF.

(4) Measure the resistance between AR2 terminal 1 and 2 and between AR2 terminal 2 and 3, the normal reading should be 23-43 ohms.

(a) If you have a normal reading you would perform step (4).

(b) If your readings were abnormal, you would check for a shorted capacitor C22 by using continuity checks. If the recorded resistance value is abnormal:

1. Replace AR2.

2. Replace transformer T4.

3. Replace C22 discrete component if the part is available.

(5) Perform equipment settings as follows:

(a) DC POWER: ON.

(b) AN/URM-127 audio oscillator set for 1 kHz, at 2.75 volts.

(6) Measure the signal amplitude between terminal AR2-4 and AR2-5. The normal indication should be 10-20 mv RMS. If you have a normal reading, this tells you to replace AR2 and then repeat the functional test.

(7) Measure the amplitude of the signal between the white and red terminals of T3 (headset amplifier input transformer secondary). The normal indication should again be 10-20 mv RMS. A normal reading would tell you to replace T3 and repeat the functional test.

(8) Perform equipment settings as follows:

(a) MK-994/AR DC POWER: OFF.

(b) Remove audio signal.

(9) Using a ME-26, measure the continuity between J19-A (MK-994/AR) and COMM CONT 2, TB1-17. Normal reading: Short circuit; an abnormal reading would mean for you to replace faulty wiring and then repeat the functional test.

Again, take your ME-26 and measure the resistance between J-19A (MK-994/AR) and COMM CONT 2, TB1-16. The normal reading: 3,300 to 3,700 ohms. An abnormal reading would mean for you to replace R32 and repeat the functional test.

(10) Turn your VOL control fully clockwise and measure the resistance between J-19A and COMM CONT 2, TB1-18.

(a) A normal reading: 30-50 ohms (VOL control full clockwise).

(b) An abnormal reading would tell us that R36 should be replaced, then repeat the functional test.

(11) To take the next resistance measurement you will need to locate T3 (white terminal) and to check the resistance between it and TB1-9. A normal reading should be 40-60 ohms. An abnormal reading would tell us to check the value of R34, R36, and R37 and to replace the defective resistor(s). (See Figure 11.)

Figure 11. T3, white terminal.

NORMAL READING: 10-20 MV rms.

(12) Measure the resistance between J-19B (MK-994/AR) and COMM CONT 2, TB1-24.

(a) Normal reading: Short (less than 0.5 ohm).

(b) An abnormal indication would mean for you to check for a faulty wire, continuity test and repair, then perform functional test.

d. Subtest 4. Fault code 1|1 covers all other functions.

(1) To familiarize you with using the troubleshooting charts found in your technical manual, we will perform the final subtest using those charts from TM 11-5821-262-35.

NOTE: Use TM extract.

(2) Using the TM extract, carefully go through and perform each step of Subtest 4 for "All Other Functions."

(3) When completed with Subtest 4, go back over other subtest procedures in order to review for understanding.

(4) Your OJT monitor will provide you with malfunctioning C-6533s to practice your troubleshooting techniques. If you have any problems with this lesson, retake the lesson and then do the practice exercises for this lesson before continuing the subcourse.

LESSON 2
PRACTICE EXERCISE
(Performance: Hands-On With Equipment)

NOTE: Refer to page viii for instructions on completing the practice exercise.

	1ST ATTEMPT			2D ATTEMPT		
SUBTASK	GO	NO-GO	SOJT MONITOR'S INITIALS	GO	NO-GO	SOJT MONITOR'S INITIALS
1. Peform basic test (Paragraph 3-8 TM 11-5821-262-35.						
a. Connect communications control under test and test equipment as shown in Figure 7.						
b. Turn on all test equipment.						
c. Set front panel controls of test facilities kit to the proper position.						
d. Perform test procedures.						
e. If malfunction occurs, stop and proceed to appropriate subtest in Fault Isolation Guide (Paragraph 3-8b).						
2. Perform subtest 1, protective device and filter assembly VR1.						
a. Connect test equipment.						
b. Place equipment controls to proper settings.						

SUBTASK	1ST ATTEMPT GO	1ST ATTEMPT NO-GO	1ST ATTEMPT SOJT MONITOR'S INITIALS	2D ATTEMPT GO	2D ATTEMPT NO-GO	2D ATTEMPT SOJT MONITOR'S INITIALS
c. Perform test procedures.	___	___	_____	___	___	_____
d. Isolate malfunction.	___	___	_____	___	___	_____
3. Perform subtest 2, microphone amplifier AR1.	___	___	_____	___	___	_____
a. Connect test equipment.	___	___	_____	___	___	_____
b. Place equipment controls to proper settings.	___	___	_____	___	___	_____
c. Perform test procedures.	___	___	_____	___	___	_____
d. Isolate malfunction.	___	___	_____	___	___	_____
4. Perform subtest 3, headset amplifier AR2.	___	___	_____	___	___	_____
a. Connect test equipment.	___	___	_____	___	___	_____
b. Place equipment controls to proper settings.	___	___	_____	___	___	_____
c. Perform test procedures.	___	___	_____	___	___	_____
d. Isolate malfunction.	___	___	_____	___	___	_____
5. Perform subtest 4, all other functions.	___	___	_____	___	___	_____

SUBTASK	1ST ATTEMPT			2D ATTEMPT		
	GO	NO-GO	SOJT MONITOR'S INITIALS	GO	NO-GO	SOJT MONITOR'S INITIALS
a. Connect test equipment.	___	___	_____	___	___	_____
b. Place equipment controls to proper settings.	___	___	_____	___	___	_____
c. Perform test procedures.	___	___	_____	___	___	_____
d. Isolate malfunction.	___	___	_____	___	___	_____

LESSON 2
PRACTICE EXERCISE
(Performance-Oriented)

1. What is the first step in troubleshooting the C-6533/ARC?

   a. Perform operational test.

   b. Visually inspect the C-6533 for defects.

   c. Connect test equipment.

   d. Turn on power supply.

2. During the protective device and filter assembly VR1 subtest, what is the normal continuity indication between J19-A test facilities kit and relay K1 terminal 5 in communications control 2.

   a. Infinite.

   b. 50 K ohms.

   c. Short circuit (zero ohms).

   d. 100 ±5 percent.

3. What is the normal forward resistance measurement between terminals E5 and E4 on communications control 2?

   a. Zero ohms.

   b. Short circuit (zero ohms).

   c. 30 ohms approximately.

   d. 25 kohms.

4. The HOT MIKE switch provides for

   a. UHF transmitter keying.

   b. Interphone operation (hands free).

   c. Interphone shock protection.

   d. NAV receiver selection.

5. Device VR1 provides for

   a. variable receiver gain.

   b. voltage polarity protection.

   c. receiver audio selection.

   d. transmitter audio level adjustment.

LESSON 3

REPAIR COMMUNICATIONS SYSTEM CONTROL C-6533

TASK

Repair communications system control C-6533.

CONDITIONS

PERFORMANCE: Given a C-6533, extracts of TM 11-5821-262-35, MK-994/AR, multimeter ME-26B/U, multimeter AN/PSM-45, signal generator AN/URM-127, voltmeter ME-30A/U, headset microphone H-101A/U (two each), tool kit TK-105G, and a qualified OJT monitor.

PERFORMANCE-ORIENTED: Given information contained in this lesson, pencil, paper, and without supervision.

STANDARD

PERFORMANCE: Minimum acceptable performance is evident when the student can repair interphone communication set C-6533 by replacing a faulty replaceable part/component assembly in one of two attempts within 30 minutes IAW Chapters 3 and 4 of TM 11-1521-262-35.

PERFORMANCE-ORIENTED: Demonstrate competency of task skills and knowledge by correctly responding to 80 percent of the multiple-choice test covering repair of communications system control C-6533.

Learning Event 1
REPAIR COMMUNICATIONS SYSTEM CONTROL C-6533

1. Isolation of the faulty component in your previous lesson requires you to perform the repair task. The task is the removal and replacement of the faulty part/component assembly, and then the final operational test to verify that the repair is completed.

a. When performing the repair task, ensure that the necessary tools and equipment are available. (See TM 11-5821-262-35.)

CAUTION

NEVER REMOVE AND REPLACE COMPONENTS WITH POWER APPLIED. ENSURE THAT ALL POWER IS REMOVED FROM THE C-6533 BEFORE PERFORMING THIS TASK.

2. The removal of the faulty part/component assembly should always be performed with the correct tools and equipment.

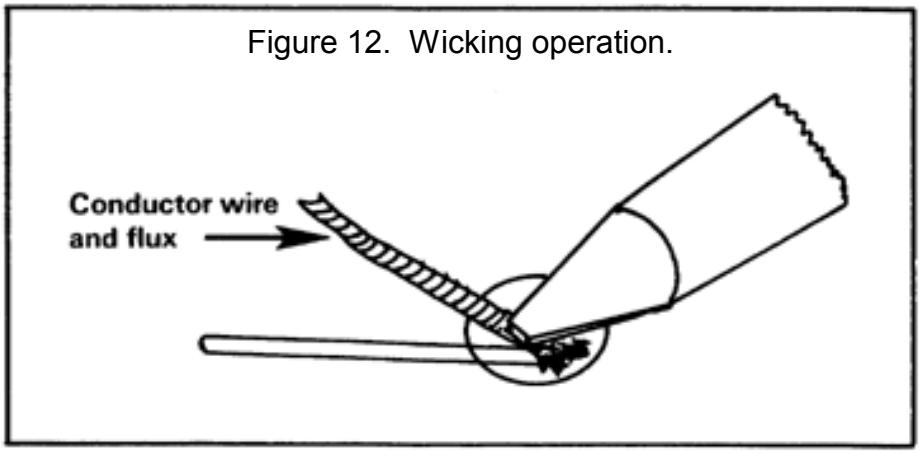
a. Use the correct size soldering iron when the job requires unsoldering a component or assembly (25-watt maximum).

b. Before starting your unsoldering procedure, always use appropriate safety glasses or goggles.

c. When removing the solder:

(1) Solder should be removed from terminals and solder cups either by using mechanical vacuum devices or by wicking with a stranded conductor or shielding braid and flux. In wicking with stranded conductor or shielding braid and flux, place the wire on the solder connection and place the hot soldering iron tip on the wire. The iron tip and the wire shall be removed simultaneously as soon as the desired amount of solder has wicked into the stranded wire. Remove all residual flux and contaminants. (See Figure 12.)

Figure 12. Wicking operation.



(2) Surfaces of printed boards with connections to be unsoldered. Unsoldering operations shall be accomplished in such time and manner that the printed board material or components are not degraded or damaged.

(3) Rework the solder connection clean and prepare all reworked solder connections. All connections shall meet original soldering requirements.

d. Some components and assemblies are socketed or connected via wire bundle and electrical connector.

(1) Removal and replacement of sockets for IC and transistorized components require similar desoldering techniques as mentioned above, only greater care is to be taken to prevent damage to fragile conductive material.

CAUTION

MANY NEW COMPONENTS AND COMPONENT ASSEMBLIES ARE HIGHLY SENSITIVE TO STATIC VOLTAGES.

(2) Care should be taken in the removal and replacement of nonsocketed ICs and transistorized components. Assemblies using CMOS devices should be installed using appropriate static discharge preventive measures. Currently, the components used in the C-6533 are not fabricated using these sensitive components.

(3) Replacement of component connectors, multipinned connector assemblies, and cannon plugs require use of special handtools. These special handtools should be available in your shop's general purpose maintenance kit MK-693/A.

(4) Make sure to tag all wires when replacing connector and plug assemblies. This practice will be especially helpful when wiring diagrams and color codes are not available.

(5) Wire bundle repair such as splices should be avoided if at all possible. The most effective repair of an open or heat damaged wire would be to replace the complete conductor with the same gauge wire.

3. Replacement of component assemblies will be according to standard shop practice and procedures. Care should be taken to avoid damaging the new replacement component assembly. Use appropriate tools for component installation.

4. After replacing the faulty part/component assembly, make a good visual inspection of the component card assembly and/or any related wires or switches.

a. Check for clean, neat solder connections.

b. Check for loose, broken, or frayed wires.

c. Check for bent or crimped pins on connectors and jacks.

d. Check for loose or misplaced screws, washers, or excess solder.

5. Perform any system adjustments or alignments required. See TM 11-1521-262-35, Chapter 3, Section III.

6. Reassemble the C-6533 IAW TM 11-5821-262-35, Chapter 3.

7. Perform operational test to verify repair is complete.

8. Perform final inspection and return equipment to production control.

9. Should the C-6533 not meet standards and it is deemed the unit requires a higher level maintenance, refer the unit to the next higher echelon of maintenance.

10. This completes Lesson 3, Repair Communications Control Set C-6533.

11. Practice all the test procedures in this lesson before taking the final examination. Make sure that you know how to use the troubleshooting chart used in this subcourse.

12. When ready, inform your OJT monitor you are ready for the final communications control set examination.

13. We have just completed Lesson 3, Repair of Communications Control Set C-6533; if you had problems with this lesson, retake the lesson and then do the practice exercises for this lesson before continuing the subcourse.

LESSON 3
PRACTICE EXERCISE
(Performance: Hands-On With Equipment)

NOTE: Refer to page viii for instructions on completing the practice exercise.

SUBTASK	1ST ATTEMPT GO	1ST ATTEMPT NO-GO	1ST ATTEMPT SOJT MONITOR'S INITIALS	2D ATTEMPT GO	2D ATTEMPT NO-GO	2D ATTEMPT SOJT MONITOR'S INITIALS
1. Perform faulty component/ circuit removal.	____	____	_____	____	____	_____
a. Use proper safety procedures.	____	____	_____	____	____	_____
b. Perform component/circuit removal with appropriate handtools, and/or desoldering equipment.	____	____	_____	____	____	_____
2. Install new replacement component.	____	____	_____	____	____	_____
a. Adhere to safety procedures.	____	____	_____	____	____	_____
b. Install the replacement component using appropriate handtools, and/or soldering equipment.	____	____	_____	____	____	_____
3. After component/ circuit card replacement, perform a good visual inspection of the component, card assembly, and/or any related wires or switches.	____	____	_____	____	____	_____

SUBTASK	1ST ATTEMPT GO	1ST ATTEMPT NO-GO	1ST ATTEMPT SOJT MONITOR'S INITIALS	2D ATTEMPT GO	2D ATTEMPT NO-GO	2D ATTEMPT SOJT MONITOR'S INITIALS
4. Perform any alignment/adjustments required IAW TM 11-5821-262-35.	____	____	_____	____	____	_____
5. Perform operational test to verify repair completed.	____	____	_____	____	____	_____

LESSON 3
PRACTICE EXERCISE
(Performance-Oriented)

1. When performing the repair task you should never

   a. smoke while performing the task.

   b. remove the component with power applied.

   c. use a 25-watt soldering iron.

   d. remove the component with power disabled.

2. A good method of preventing equipment return for performance failure is to

   a. make a good visual inspection of the component/card assembly after installation procedure is completed.

   b. always use number 22 solid wire for repair connections.

   c. use solder flux when soldering.

   d. work fast and use shortcuts.

3. The best method for preventing personal injury while repairing equipment is to

   a. use noninsulated equipment.

   b. adhere to all safety procedures.

   c. work alone.

   d. wear damp clothing.

4. What is the final step in repair task to ensure repair is complete?

   a. Localize fault.

   b. Install new component.

   c. Perform operational test.

   d. Perform visual inspection.

5. Maladjustment and misalignment of equipment could be

   a. the cause of equipment performance failure.

   b. the cause of poor performance.

   c. caused by inexperienced repair personnel.

   d. All of the above.

PAGES 43 THRU 53

ARE TM EXTRACT REPAIR CHARTS

AND ARE PROVIDED AS A SEPARATE PDF DOCUMENT.

ANSWERS TO PRACTICE EXERCISES

Lesson 1

1. c.
2. b.
3. d.
4. d.
5. c.

Lesson 2

1. b.
2. c.
3. c.
4. b.
5. b.

Lesson 3

1. b.
2. a.
3. b.
4. c.
5. d.